A Watershed Conditions Report For the State of Kansas
HUC 11070202
(UPPER COTTONWOOD) Watershed

The Cottonwood River, Photograph courtesy of The Central Plains Center for BioAssessment, www.cpcb.ukans.edu/

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Watershed Conditions Report
For
HUC 11070202 (UPPER COTTONWOOD)

Prepared by
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Nonpoint Source Section
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EXECUTIVE SUMMARY

This Watershed Conditions Report is designed to serve as a water quality "atlas", and is intended to provide stakeholders in water quality with a tool to assess the condition of water resources within their watershed. Surface water quality for HUC 8 11070202 streams and rivers is generally fair with over half of the surface water bodies supporting their designated uses. The primary pollutant concern within HUC 8 11070202 streams and rivers is fecal coliform bacteria (FCB). FCB is a bacteria present in human and animal waste and serves as an indicator of potential disease causing organisms. Additional pollutants in this watershed are sulfate, chlordane, low dissolved oxygen (DO), and ammonia. Sulfate is a naturally occurring mineral which is easily dissolved by water. Sulfate concentrations may increase with low flow of water and irrigation. Chlordane is a pesticide often used for termite control. Low (DO) levels typically coincide with an abundance of algae. This causes the population of decomposers to increase, which in turn uses up oxygen in the stream or river. Low DO may be caused by high water temperature. Ammonia is a chemical toxic to fish and aquatic organisms.

There is one large reservoir, Marion Lake, and many smaller state fishing lakes, private ponds and wetland areas within HUC 8 11070202. The primary pollutant concern for lakes within the watershed is eutrophication. Eutrophication is a natural process which creates conditions favorable for algae blooms and excess plant growth. This process is often accelerated by excess nutrient loading from the watershed.

Groundwater resources in HUC 8 11070202 include the alluvial aquifers of the Cottonwood River and it's tributaries and portions of the Dakota aquifer. Water from these aquifers typically hard with chloride and sulfate as primary pollutant concerns.

PURPOSE

The Watershed Conditions Report is designed to serve as a water quality "atlas" for a given watershed, and is intended to provide Watershed Stakeholders Committees (WSC) with a tool to assess the condition of water resources within their watershed.

BACKGROUND

The Clean Water Act mandates that States assess the quality of their waters and implement Total Maximum Daily Loads (TMDLs) for water bodies that do not meet their designated uses. The following is a summary of steps taken by the State of Kansas to comply with these requirements of the Clean Water Act.

The Kansas Department of Health and Environment (KDHE) prepared the Kansas Unified Watershed Assessment in 1998. This assessment classifies the State's watersheds into four categories. A Category I classification means the watershed is in need of restoration due to having water quality impairments or degradation of other natural resources related to an aquatic habitat, ecosystem health and other factors related to aquatic life resources. Category II watersheds are in need of protection. Category III are watersheds with pristine or sensitive aquatic system conditions on lands administered by federal, state, or tribal governments. Category IV watersheds are those for which there is insufficient data to make accurate classification. KDHE has assigned a restoration priority score to each Category I watershed.

As mandated by section 303(d) of the Clean Water Act, lakes and streams within the Category I watersheds, which do not meet water quality standards, are published biannually in the 303(d) list. Subsequently, lakes and streams which appear on the 303 (d) list are scheduled to have a Total Maximum Daily Load (TMDL) prepared. KDHE is currently preparing TMDLs for impaired stream segments located within the highest restoration priority watersheds.

To restore water quality within the Category I watersheds, KDHE recommends the implementation of a Watershed Restoration and Protection Strategy (WRAPS). The ultimate goal of the WRAPS process is to create and implement a plan to restore the health of water bodies that do not meet their water quality standards. Additionally, the WRAPS process will insure that water bodies that currently meet their water quality standards are protected.

KDHE recommends that the WRAPS process be implemented on a local level by a Watershed Stakeholders Committee (WSC). The WSC would have the responsibility of working with local and state agencies to develop a WRAPS plan. This plan should identify the following: public outreach methods; required monitoring activities based on water quality goals and outcomes; specific water quality problems; watershed coordinator/evaluator; actions to be taken to achieve water quality goals and outcomes; schedule for implementation of needed restoration measures; and funding needs.

Streams and Rivers

HUC 8 11070202

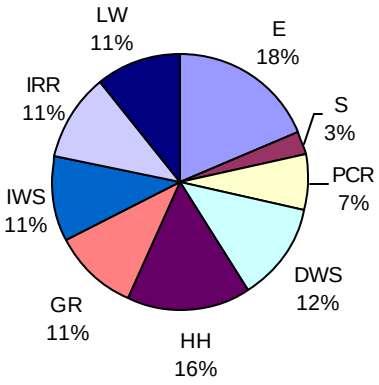
The Huc 8 11070202 watershed is ranked thirty-sixth in priority for watershed restoration throughout the state. According to the Unified Watershed Assessment, 41.6% of the total miles of water in this watershed do not meet their designated uses. The Cottonwood River, Clear Creek and Spring Creek are among the larger streams/rivers in this watershed. See Attachment 1 for a map of streams and rivers in HUC 8 11070202.

Designated Uses

This watershed is primarily a drainage basin for Cottonwood River and its tributaries. Surface waters in this watershed are generally used for aquatic life support, human health purposes, domestic water supply, ground water recharge, industrial water supply as well as many other uses shown in figure 1. There are 51 public water supplies within the watershed, many of which draw water from the Cottonwood River and its alluvium.

Figure 1

Surface Water Uses



- HH=Human Health
- PCR=Designated for contact recreational use
- DWS=Designated for domestic water supply use
- GR=Designated for ground water recharge
- IRR=Designated for irrigation use
- IWS=Designated for industrial water supply use
- LW=Designated for livestock use
- S=Special Aquatic Life Use Water
- E=Expected Aquatic Life

TMDL/Contaminate Concerns

Streams and rivers throughout Kansas have been sub-divided into segments. By dividing the streams and rivers into segments they can be better analyzed and understood. A reach of river or stream may have segments which vary greatly in water quality, based on surrounding land uses. The figures below display the impairments of the streams and rivers based on the number of segments sampled.

Surface waters not meeting their designated uses will require total maximum daily loads (TMDLs). Figure 2 shows 36% of the stream/river segments sampled need TMDLs. Streams/river segments in this watershed are impaired by fecal coliform bacteria (FCB), sulfate (SULF), chlordane (CHLORD), low

dissolved oxygen (DO), and ammonia (NH3). Approximately 42% of the sampled streams/rivers are impaired by FCB, 38% are impaired by sulfate (SULF), 10% are impaired by chlordane (CHLORD), 5% have low DO levels, and 5% are impaired by ammonia (NH3) (Figure 3).

FCB is a bacteria present in human and animal waste. It serves as an indicator of potential disease causing organisms. FCB has the ability to multiply in higher water temperatures, therefore creating health risks to humans, animals and aquatic organisms that come into contact with the water. Sulfate is a naturally occurring mineral that is dissolved by water. Sulfate has the potential to increase with irrigation practices and low flow of water. Chlordane is a pesticide often used for termite control. Ammonia is a chemical, which is toxic to fish and other aquatic organisms.

Figure 2

Percentage of Stream/River Segments Needing TMDL's
(Percentage of total segments)

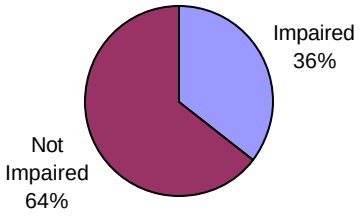
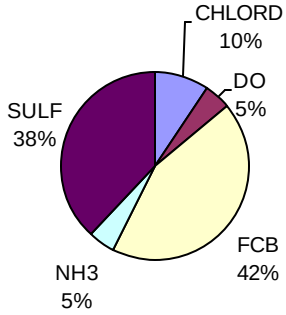


Figure 3

TMDL Distribution - Rivers
(Percentage of impaired segments)



Potential Pollution Sources

Potential sources of FCB include feedlots, livestock, some older wastewater treatment facilities, septic systems, and wildlife. Potential sources of chlordane may be caused from urban and suburban areas. Low (DO) levels typically coincide with an abundance of algae. This causes the population of decomposers to increase, which in turn uses up oxygen in the stream or river. Low DO may be caused by high water temperature due to the lack of riparian shading. Potential sources of ammonia include livestock, septic systems, wildlife, and wastewater facilities.

Land Use

Land use composition can have a significant affect on the types and quantity of nonpoint source pollutants in the watershed. Below are a list of the land uses in this watershed which can affect a stream or river segment. Grassland is considered grazingland for livestock.

- Urban Area…. 0.5%
- Row Crop…. 18.7%
- Grassland…. 77.8%
- Wooded Area…. 2.1%
- Water Area…. 0.9%
- Other….0.0%

Feedlots: In Kansas, confined animal feeding operations (CAFOs) with greater than 300 animal units must register with KDHE. There are approximately 222 registered CAFOs located within HUC 8 11070202 (this number, which is based on best available information, may be dated and subject to change). Waste disposal practices and wastewater effluent quality are closely monitored by KDHE for these registered CAFOs to determine the need for runoff control practices or structure. Because of this monitoring, registered CAFOs are not considered a significant threat to water resources within the watershed. A portion of the State's livestock population exists on small unregistered farms. These small unregistered livestock operations may contribute a significant source of fecal coliform bacteria and nutrients, depending on the presence and condition of waste management systems and proximity to water resources.

Wastewater Treatment Facilities: There are approximately 13 municipal and industrial wastewater treatment facilities within the watershed (this number may be dated and subject to change). These facilities are currently regulated by KDHE under National Pollutant Discharge Elimination System (NPDES) permits. These permits specify the maximum amount of pollutants allowed to be discharged to the "waters of the State". Due to the chlorination processes involved in municipal waste treatment, these facilities are not considered to be a significant source of fecal coliform bacteria; however they may be a significant source of nutrients.

Septic Systems: There are currently thousands of septic systems within the watershed and this number is increasing. When properly designed, installed, and maintained, septic systems can act as an effective means of wastewater treatment. However, poorly maintained or "failing" septic systems can leach pollutants into nearby surface waters and groundwater. The exact number of failing septic systems within the watershed is unknown; however the number may be increasing due to the current trends in suburban development. Local Environmental Protection Programs and County health departments may provide excellent sources of information regarding the proper design, installation, and maintenance for septic systems.

Wildlife: Wildlife located throughout the watershed are not usually considered a significant source of nonpoint source pollutants. However, during seasonal migrations, concentrations of waterfowl can add significant amounts of fecal coliform bacteria and nutrients into surface water resources.

Row Crop Agriculture: As stated above, approximately 18.7% of the watershed's land is used for row crop agriculture. Row crop agriculture can be a significant source of nonpoint source pollution. Common pollutants from row crop agriculture include sediment, nutrients, pesticides, and fecal coliform bacteria. Many producers within the watershed regularly implement and maintain BMPs to limit the amount of nonpoint source pollutants leaving their farm. Some common BMPs include: the use of contour plowing; use of cover crops; maintaining buffer strips along field edges; and proper timing of fertilizer application.

Urban/Suburban Runoff: Many urban landscapes are covered by paved surfaces including roads, driveways, parking lots, and sidewalks. These surfaces are impermeable and tend to divert water into storm drains at high velocities. This increased flow velocity from urban areas can cause severe stream bank erosion in receiving water bodies. Additionally, urban and suburban runoff may carry other pollutants like petroleum hydrocarbons and heavy metals. Currently, the watershed is only about .4% urban. Limiting paved surfaces is the key to slowing urban nonpoint source pollution. The use of grass swales, open spaces, and storm water retention ponds are recommended to slow runoff in urban areas.

The watershed has an increasing population living in suburban areas. Residential landscapes are often designed with large turf areas which require high amounts of water and chemicals to maintain. The use of excessive amounts of fertilizers and lawn care chemicals in residential areas can contribute a significant

amount of pollution to nearby water resources. Suburban nonpoint source pollution can be limited by: using less lawn fertilizers and chemicals; control of construction sites; proper disposal of pet waste; establishing large areas of native vegetation; and conserving the amount of water use for plant maintenance.

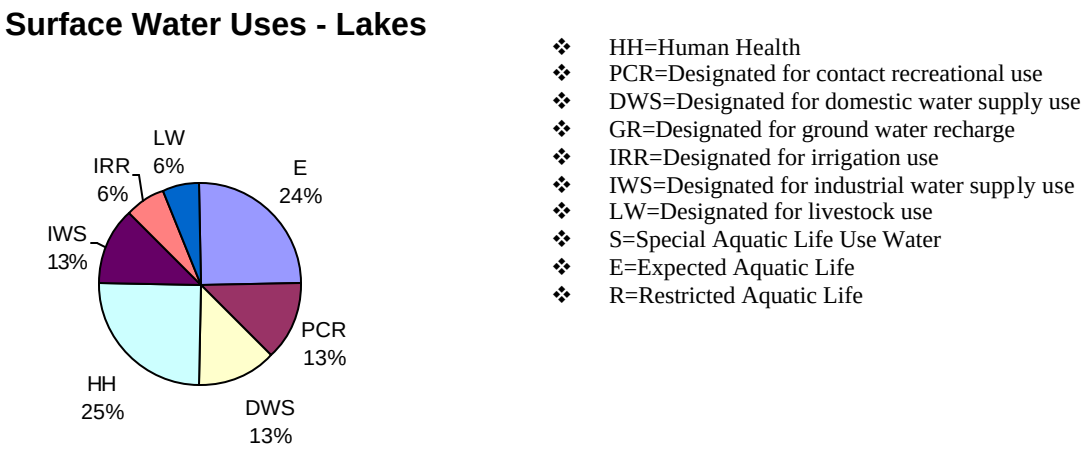
Lakes and Wetlands

Huc 8 11070202 is the home to Marion County Lake and Hillsboro City Pond as well as several small city and county lakes. These lakes are used for recreational purposes as well as a public water supply source for many local communities. Marion Lake is known for its record breaking fish population, which makes this an extremely popular place to fish in Kansas. The Marion Wetlands are also located in the north central portion of this watershed. See Attachment 2 for a map of lakes in HUC 8 11070202.

Designated Uses

According to the Surface Water Register, the majority of the lakes and wetlands in this watershed are designated for expected aquatic life, human health purposes, industrial water supply, primary contact recreation as well as several other uses shown in figure 4.

Figure 4



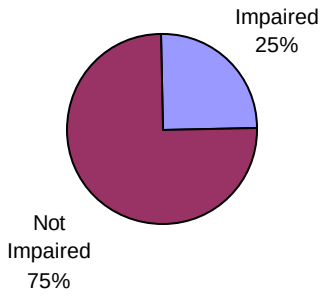
TMDL/Contaminate Concerns

Surface waters not meeting their designated uses will require total maximum daily loads (TMDL)s. Approximately 25% of this watershed's lakes/wetlands sampled need TMDLs (Figure 5). The primary pollutant for this watershed's lakes is eutrophication.

Eutrophication is a natural process which creates conditions favorable for algae blooms. This process is often excelerated by excess nutrients within the watershed.

Figure 5

Percentage of Lakes/Wetlands needing TMDL's



Potential Pollution Sources

Based on the watershed's land use percentages, the primary pollutant sources for nutrients causing eutrophication may be row crop agriculture, livestock, feedlots, and septic systems.

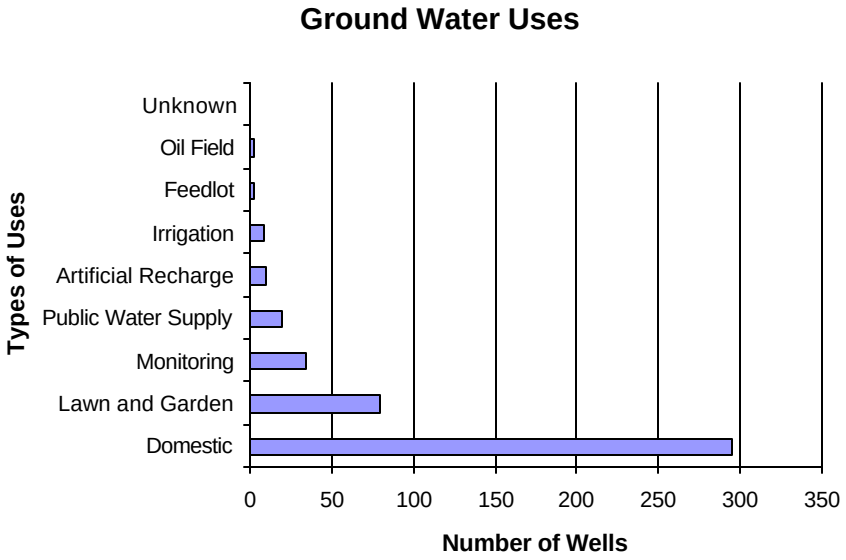
Groundwater

Major groundwater aquifers underlying this watershed include portions of the Dakota Aquifer and alluvial aquifers from the Cottonwood River and it's many tributaries. See attachment 3 for a map of groundwater aquifers.

Designated Uses

There are approximately 2645 groundwater wells located within the watershed. Water from these wells is used for domestic use, monitoring, oil fields, lawn and garden and irrigation and several other uses as shown below (Figure 7).

Figure 7



Aquifer Characteristics

Alluvial Aquifer: Alluvial aquifers of the many streams and creeks exist throughout the watershed. Alluvial aquifers provide the primary water source for many public water supplies located with in the watershed. Water quality in alluvial aquifers is generally good; however nitrates, minerals, pesticides and bacteria can be pollutant concerns.

Dakota Aquifer: The Dakota aquifer underlies portions of this watershed. Water from this aquifer is used primarily for irrigation, public use, and rural-domestic water supply. Water from this aquifer is good; however chloride and sodium content increase with depth.

Potential Pollution Types and Sources

Common groundwater pollutants include: nitrates, chloride, sulfates, bacteria and atrazine. Nitrate impaired groundwater is perhaps the most prevalent groundwater contamination problem in the State.

Nitrate: Nitrate is a naturally occurring compound and is an essential component of all living matter. However, high concentrations of nitrate in drinking water can cause adverse health effects including "blue baby" syndrome. Sources of nitrate include municipal wastewater treatment plant discharges, runoff from livestock operations, leaching of fertilizer from urban and agricultural areas, and failing septic systems.

Chloride: Chloride is a naturally occurring mineral found in Kansas lakes, streams, and groundwater. In high concentrations, chloride can cause deterioration of domestic plumbing, water heaters, and municipal water works. The primary source of chloride impacted groundwater is intrusion of salt water from deeper formations, often due to improperly constructed water wells which allow confined aquifers to come into contact with each other.

Sulfates: Sulfate is a naturally occurring mineral that can cause taste and odor problems in drinking water. Sulfates are dissolved into groundwater as the water moves through various sulfur containing rock formations.

Bacteria: Fecal coliform bacteria are found in the digestive systems of warm blooded animals. In the environment coliform bacteria is an indicator of potential disease causing organisms. Potential sources of bacteria contamination in groundwater include livestock facilities, septic systems, pets, and wildlife. Many wells are impacted by bacteria due to improper construction which allows water from the surface to funnel directly into the well.

Ammonia: Ammonia is a chemical which is toxic to fish and aquatic organisms. Sources of ammonia are livestock, septic tanks, fertilizer, municipal and industrial waste.

TSS: TSS stands for Total Suspended Solids which are particles such as soil, algae, and finely divided plant material suspended in water. Sources of TSS are soil erosion from cropland, stream banks, or construction sites, and municipal and industrial waste.

VOCs: Volatile Organic Compounds, also called purgeable organics, are components of fuels and solvents. They are ingredients in many household and industrial products. Sources of VOCs are leaking fuel storage tanks, trash dumps, and some agricultural pesticides.

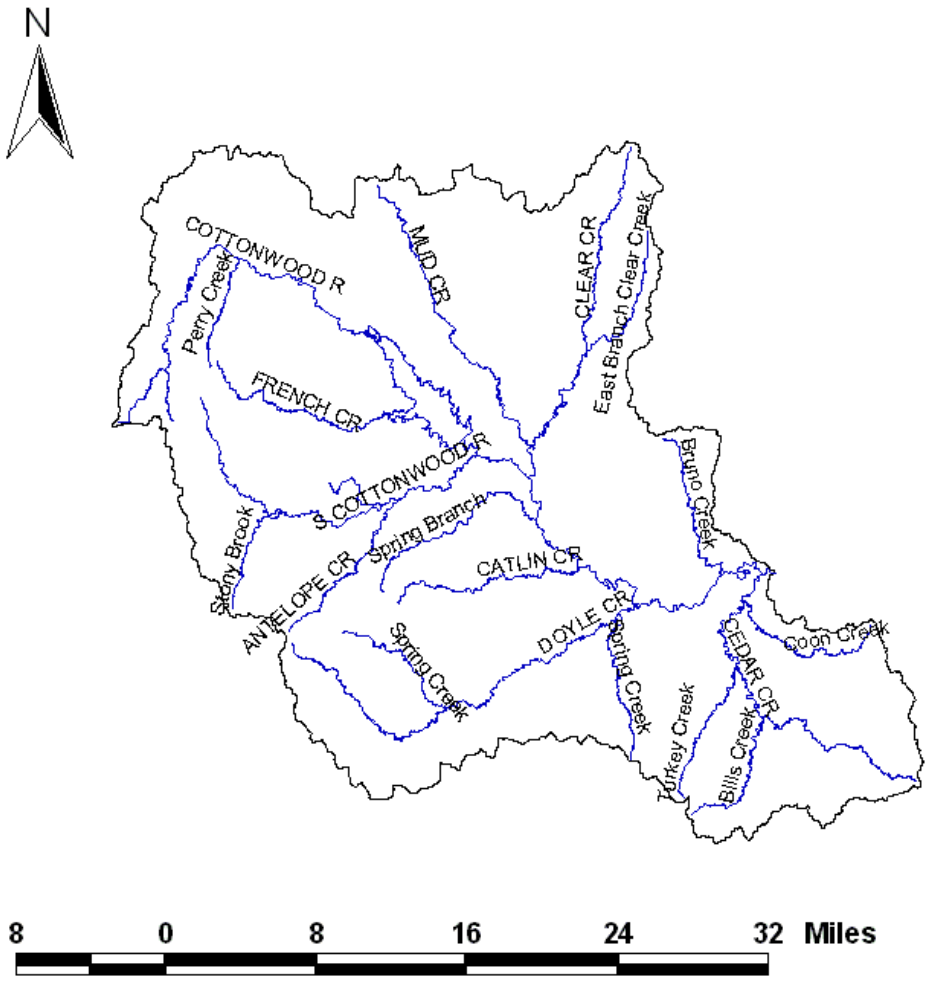
Iron: Iron is a naturally occurring element found in the soil throughout Kansas. It is an annoyance as it has an objectionable taste, causes a red stain to porcelain fixtures and laundry, and causes plumbing irritations.

Manganese: Manganese is a naturally occurring element and causes an unpleasant taste in drinking water, stains porcelain and laundry, and collects deposits in plumbing. It is naturally occurring throughout the soils in the state.

Attachment 1

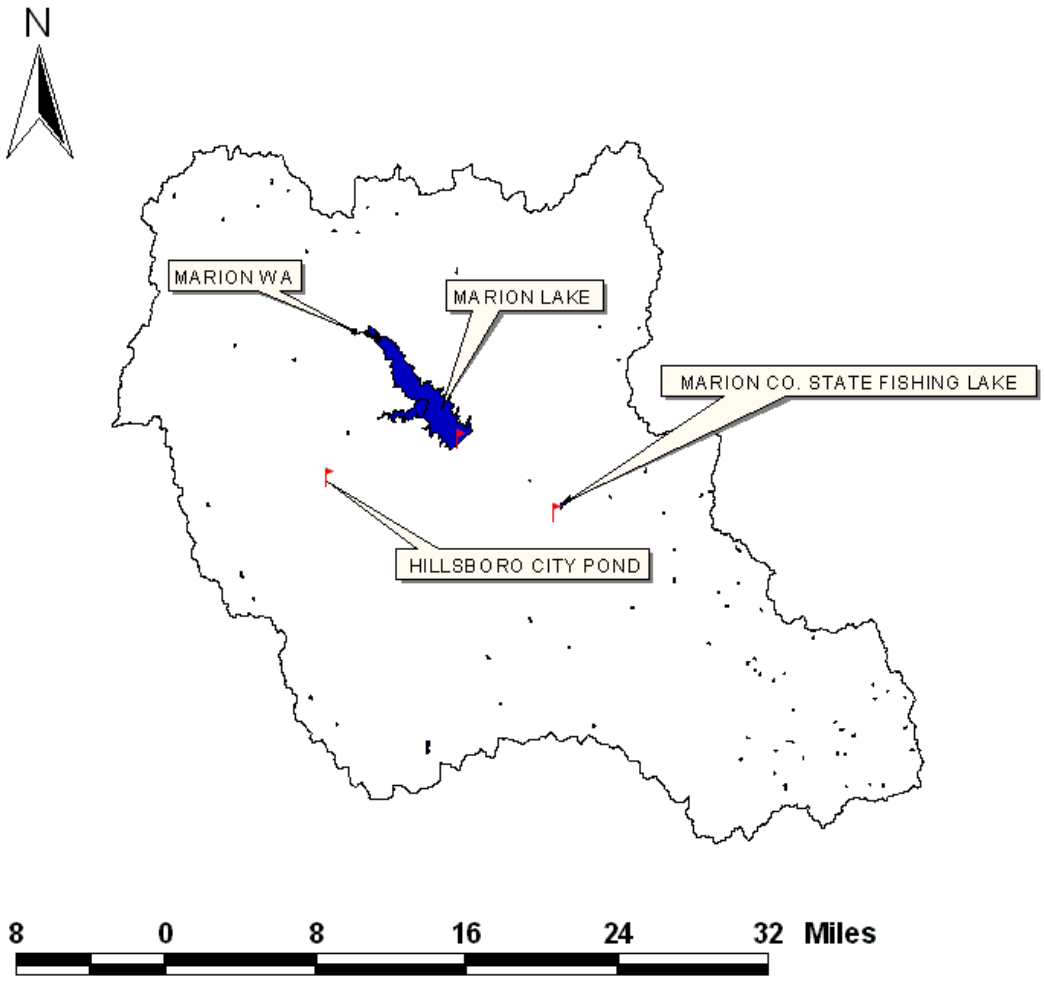
Maps

Huc -11070202- Upper Cottonwood Streams and Rivers

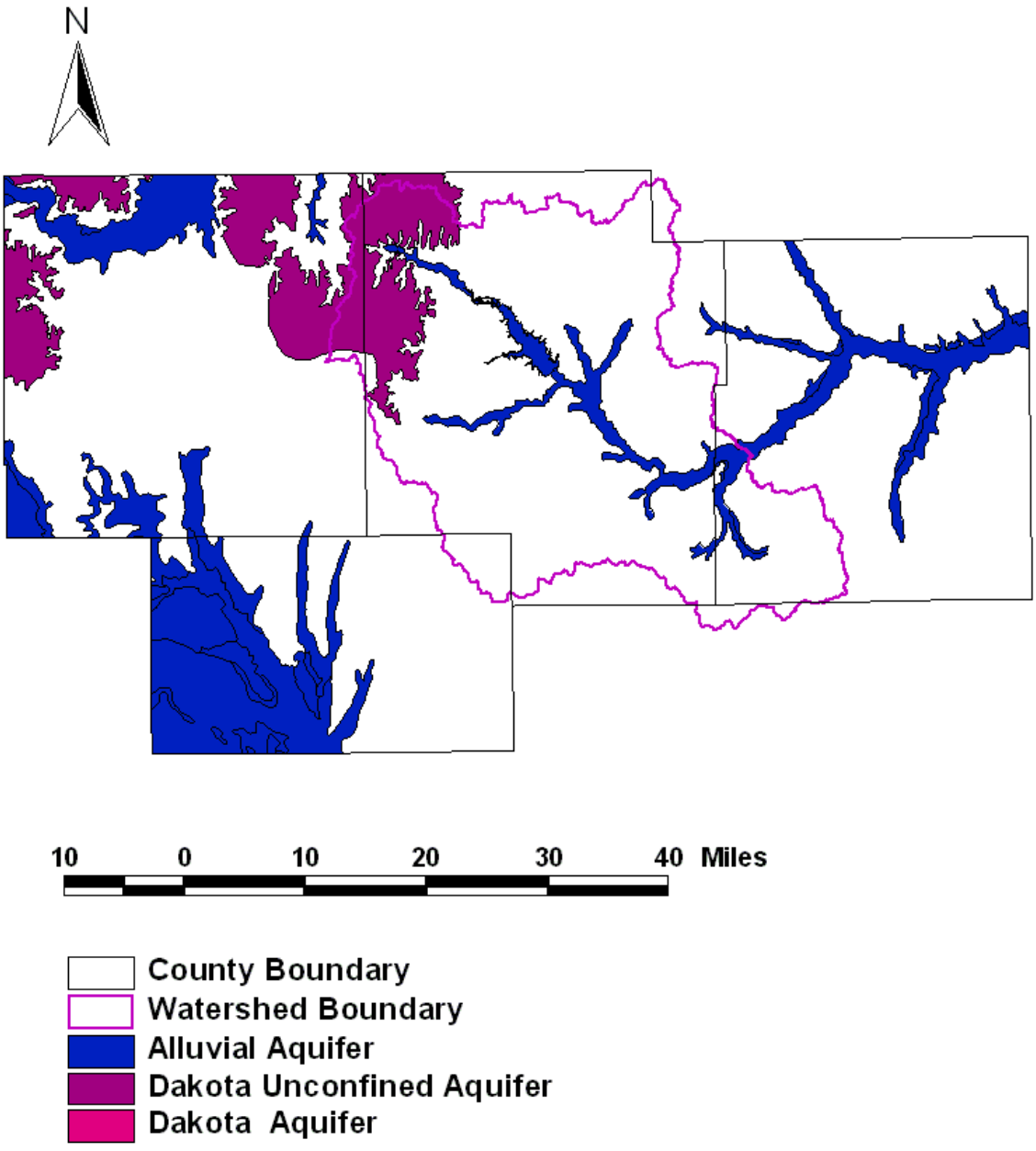


Rivers and Streams
Watershed Boundary

Huc -11070202- Upper Cottonwood Lake Monitoring Sites



Huc -11070202- Upper Cottonwood Groundwater Aquifers



Huc -11070202- Upper Cottonwood Watershed Boundary